# REPORTS FROM THE Scientific Board

## CHOLESTEROL

***Current Status in Atherosclerosis and Coronary Heart Disease***

IT IS NOW established that, in unselected American population groups, persons having high blood levels of cholesterol (and other lipids and lipoproteins) have an increased risk of subsequent development of one sequela of atherosclerosis: coronary heart disease. This has been shown in studies carried out by the United States Public Health Service in Framingham, Massachusetts, and elsewhere. This does not mean that a person with a low blood cholesterol level will not develop coronary heart disease at any time in his life. It means simply that the level of cholesterol in the blood is one significant risk factor. There are many other factors such as relative weight, blood pressure, personality type and heredity, which are regarded as known; it can be reasonably assumed that there are still others which are unknown.

It has *not* been shown that reduction of cholesterol levels can prevent or delay the onset of atherosclerosis or coronary heart disease in man. Work in experimental animals, however, has shown that procedures leading to elevated blood cholesterol levels can lead to atherosclerosis of a type resembling that observed in man, including coronary arterial disease—except that the fibrotic stage—thrombosis—and large myocardial infarcts are uncommon. In addition, it is known that population groups having low levels of blood cholesterol also have a low rate of development of coronary heart disease. These facts, taken together, have led to the hypothesis that reduction of serum cholesterol and other lipids and lipoproteins will reduce the incidence of coronary heart disease in populations, such as ours, in which the levels are relatively high. Testing the validity of this hypothesis will be an extremely difficult procedure, but a start has been made, and it is possible that useful information will be available in the next few years.

Cholesterol is carried in the blood plasma in the form of large molecular complexes known as lipoproteins. In man the largest percentage of cholesterol is carried in lipoproteins having a density of about 1.03 (that is, low density or beta lipoproteins), but it can be found in significant amount in other lipoprotein fractions including the higher density alpha lipoproteins. Other larger lipoproteins, of density about 0.98, carry most of the fat or triglycerides in the blood. The concentration of beta lipoproteins is elevated in subjects with coronary heart disease, and conversely that of the alpha lipoproteins is diminished. As mentioned above, epidemiological studies have implicated cholesterol and, consequently, *low density lipoproteins* as risk factors in the development of this disease. The risk related to high levels of triglycerides, total lipids and phospholipids has not yet been established or shown to be significant by comparable epidemiologic investigations.

Since lipids have been implicated in atherogenesis, experimentally and pathologically, and since they are only one of many factors etiologically concerned that can be manipulated with facility, it seems logical to attempt to reduce the incidence and progress of the disease by dietary management. However, reduction of the intake of fat in the diet can affect cholesterol and triglycerides differently. Diets which are low in fat (and necessarily high in carbohydrate) tend to reduce the concentration of cholesterol in the blood but to elevate that of triglycerides. Diets rich in poly-unsaturated fatty acids tend to reduce the concentration of cholesterol and have little effect on the triglycerides. The amount of cholesterol in the diet can, in some circumstances, increase the level of cholesterol in the blood with no effect on triglycerides. While there has been no proof that lowering the blood lipids has a beneficial effect on the atherogenic process, there is considerable evidence to show that decreased lipids and calories in the diet can reduce blood lipids to a varying degree.

Measurements of the concentration of practically all lipids including cholesterol, total lipids, phospholipids, triglycerides and lipoproteins in the blood plasma are generally available as routine laboratory procedures. The physician should place confidence in only those methods which have been shown to fulfill the criteria of accuracy (specificity) and precision (reproducibility) supported by good quantity control. It should be emphasized, however, that the significance of cholesterol and other blood lipid levels has not been established to the same degree for the individual as for the group.

A statement from the Committee on Scientific Information of the Scientific Board, California Medical Association.